REMARKS

Reconsideration and allowance of the present application are respectfully requested. Claims 9, 11-13, 17-19, 22, 23, 26, 30 and 31 remain pending in the application. Claims 1-7, 15, 16, 20, 21, 24, 25, 27, 28 and 29 were previously canceled. By the foregoing amendment claims 12 and 30 are amended; claim 31 is added; and claims 8, 10 and 14 are canceled without prejudice to place the application in condition for allowance.

Applicant notes with appreciation the Examiner's indication on page 8 of the Office Action that claim 9 contains allowable subject matter.

On page 2 of the Office Action, independent claim 30 is rejected as being anticipated by JP 356091942A (Takahashi). On page 3 of the Office Action, independent claim 12, along with various dependent claims, is rejected as being anticipated by, or unpatentable over, U.S. Patent 3,757,855 (Kun et al.). On page 5 of the Office Action, dependent claim 18 is rejected as being unpatentable over the Kun patent in view of U.S. Patent 4,550,694 (Evans). On page 6 of the Office Action, independent claim 12, along with various dependent claims, is rejected as being unpatentable over U.S. Patent 4,997,031 (Kashiwada '031) in view of the Kun et al. patent. On page 7 of the Office Action, dependent claims 18 and 19 are rejected as being unpatentable over the Kashiwada '031 patent in view of the Kun et al. patent, and further in view of U.S. Patent 4,893,669 (Kashiwada '669). These rejections are respectfully traversed.

Applicants have disclosed a compression-molding sheet-metal joining method and a heat exchanger forming a flow-through chamber for a heat transfer medium. As shown in by Fig. 1, an exemplary heat exchanger forming a flow-through

chamber for a heat transfer medium include two sheet-metal walls. The sheet-metal walls can be sheet-copper walls (e.g., paragraph [0010]) having a plurality of approximately circular indentations between the edges of the heat exchanger (e.g., paragraph [0009]). The indentations can be in contact and placed back-to-back to one another, defining connecting points (e.g., paragraph [0012]). Such sheet-copper walls can be positively engaged by annular denticulations compression molded on the connecting points. The denticulations can have a spacing on all sides from an edge of the indentation, and can be disposed with a mutual spacing between the denticulations of from 10 to 50 mm (e.g., paragraphs [0021] and [0043]).

Applicant has discovered that the disclosed compression-molding sheet-metal joining method produces a heat exchanger able to withstand high tensile force attributable to the annular denticulations compression molded on the connecting points. Applicant has also discovered that these and other advantages can be equally achieved by using sheet-copper walls, which is not used in the industry for forming compression-molded connections (e.g., paragraph [0006]). The disclosed compression-molding sheet-metal joining method has shown to be cost saving when compared to soldering, brazing or gluing. It advantageously saves energy and time, and no particular joining material is needed, no curing time is required, no heating is involved, and a great number of connecting points can be press-molded simultaneously, resulting in a heat exchanger having connections that stay bonded even under high tensile forces.

The foregoing features are broadly encompassed by claim 12, which recites, among other features, a heat exchanger forming a flow-through chamber for a heat transfer medium, including, two sheet-copper walls having edges, the walls having a

plurality of approximately circular surface indentations between the edges, the indentations being in contact and placed back-to-back to one another and defining connecting points, the two sheet-copper walls being positively engaged by annular denticulations compression molded on the connecting points, the denticulations having a spacing on all sides from an edge of the indentation and being disposed with a mutual spacing between the denticulations of from 10 to 50 mm. Claims 30 and 31 recite similar structural features having sheet-copper walls, but do not recite a measure of spacing between denticulations.

The Takahashi publication discloses production of a heat receiving plate of a water heater utilizing solar heat. The publication is best understood to involve pressing metal blank materials provided with projecting parts for forming linear water flow parts, and extruding contact surfaces of the two metal parts and folding the parts symmetrically with a press head (Fig. 1-3 and 7). However, the Takahashi publication shows linear sealing parts 7 (W of Fig. 7). The Takashi publication does not teach or suggest a compression-molding sheet-metal joining method, including, providing two sheet-copper walls, and punctate fastening the two walls to one another at the connecting points by compression molding annular denticulations inside the indentations with spacing on all sides from an edge thereof, as recited in claim 30.

The Kun et al. patent discloses a heat exchanger with elements 30 (Fig. 4) with wall-supporting projections 31 (col. 5, lines 22-29) mated by "soldering, brazing, welding or with an adhesive filled lock-seam joint" (col. 5, lines 21-22). These disclosed methods of bonding results in noted limitations, e.g., "spacing less than 0.2 inch results in very small clearance passages" (col. 7, lines 1-2); "truncated conical

projected channels with a H/D ratio less than 0.05 would be susceptible to fouling..." (col. 7, lines 26-29); "the bounding line of intersection becomes a line of high stress concentration" (col. 7, lines 37-38); "while force-balanced embodiments wherein wall-supporting projections are bonded together and loaded in tension would be characterized by severe stress concentration in such bonded areas." (col. 7, lines 60-64). Moreover, the Kun et al. patent discloses use of aluminum sheets having truncated conicals (col. 8, lines 22-23), but the Kun et al. patent does not relate to a heat exchanger having sheet-copper walls, the two sheet-copper walls being positively engaged by annular denticulations compression molded on the connecting points. Accordingly, the Kun et al. patent does not teach or suggest a heat exchanger forming a flow-through chamber for a heat transfer medium, including, two sheet-copper walls having edges, the walls having a plurality of approximately circular surface indentations between the edges, the indentations being in contact and placed back-to-back to one another and defining connecting points, the two sheet-copper walls being positively engaged by annular denticulations compression molded on the connecting points, as recited in claim 12. Claims 30 and 31 recite similar features. Further, the Kun et al. patent does not teach or suggest denticulations having a spacing on all sides from an edge of the indentation and being disposed with a mutual spacing between the denticulations of from 10 to 50 mm, as further recited in claim 12.

The Kawashiwada '031 patent discloses a heat exchanger for a cooling tower having metallic or synthetic resin partition plates (col. 2, lines 53-55). The sheets have cone shaped expanding projections 60 as spacers for air-flowing passages (col. 9, lines 15-24). The spacers as disclosed in the Kawashiwada '031 patent are

not believed to take tensile forces. Moreover, the Kawashiwada '031 patent does not relate to a heat exchanger having sheet-copper walls, the walls having circular surface indentations, and the two sheet-copper walls being positively engaged by annular denticulations compression molded on the connecting points. Accordingly, the Kawashiwada '031 patent does not teach or suggest a heat exchanger forming a flow-through chamber for a heat transfer medium, including, two sheet-copper walls having edges, the walls having a plurality of approximately circular surface indentations between the edges, the indentations being in contact and placed back-to-back to one another and defining connecting points, the two sheet-copper walls being positively engaged by annular denticulations, compression molded on the connecting points, as recited in claim 12. Claim 31 recites similar features. Further, the Kawashiwada '031 patent does not teach or suggest denticulations having a spacing on all sides from an edge of the indentation and being disposed with a mutual spacing between the denticulations of from 10 to 50 mm, as further recited in claim 12.

The Evans patent was cited by the Examiner as showing in Fig. 1 a radiator cooling system which has a pump 38 and a radiator 42; and the Kashiwada '669 patent was cited by the Examiner as showing in Figs. 6 and 13 a system having a water tank (D or 111) and a pump 229. The Evans patent and the Kashiwada '669 patent do not cure the deficiencies of the Kun patent and/or the the Kawashiwada '031 patent. The Evans patent and the Kashiwada '669 patent, considered individually or in combination with the Kun patent and/or the the Kawashiwada '031 patent, do not teach or suggest at least a heat exchanger forming a flow-through chamber for a heat transfer medium, including, two sheet-copper walls having

edges, the walls having a plurality of approximately circular surface indentations between the edges, the indentations being in contact and placed back-to-back to one another and defining connecting points, the two sheet-copper walls being positively engaged by annular denticulations compression molded on the connecting points, as recited in claim 12. Claim 31 recites similar features. Further, the Evans patent and the Kashiwada '669 patent do not teach or suggest denticulations having a spacing on all sides from an edge of the indentation and being disposed with a mutual spacing between the denticulations of from 10 to 50 mm, as further recited in claim 12.

For the foregoing reasons, Applicant's claims 12, 30 and 31 are allowable. The remaining claims depend from the independent claims and recite additional advantageous features which further distinguish over the documents relied upon by the Examiner. Further, because the withdrawn claims depend from the respective generic and independent claims, Applicants respectfully submit that the present application is in condition for allowance.

All objections and rejections raised in the Office Action having been addressed, it is respectfully submitted that the application is in condition for allowance and a Notice of Allowance is respectfully solicited.

Respectfully submitted,

BUCHANAN INGERSOLL PC

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By: Reg No 48,360
Patrick C. Keane
Registration No. 32,858

P.O. Box 1404
Alexandria, Virginia 22313-1404
(703) 836-6620